

CHAPTER I - OPERATIONAL PROCEDURES

1. GENERAL

Services provided by the Joint Typhoon Warning Center (JTWC) include the following: (1) Significant Tropical Weather Advisories issued daily describing all tropical disturbances and their potential for further development; (2) Tropical Cyclone Formation Alerts issued whenever interpretation of satellite and synoptic data indicates likely formation of a tropical cyclone; (3) Tropical Cyclone Warnings issued four times daily whenever a significant tropical cyclone exists in the Pacific area; (4) Tropical Cyclone Warnings issued twice daily whenever a significant tropical cyclone exists in the Indian Ocean area; and (5) Prognostic Reasoning issued twice daily for tropical storms and typhoons in the Pacific area.

FLEWEACEN Guam provides computerized meteorological/oceanographic products for JTWC. Communication support is furnished by the Nimitz Hill Naval Telecommunications Center (NTCC) of the Naval Communications Area Master Station Western Pacific.

2. ANALYSES AND DATA SOURCES

a. COMPUTER PRODUCTS:

Varian plotted charts are routinely produced at synoptic times for the surface, 850 mb, 700 mb, and 500 mb. A chart of upper tropospheric data is produced which utilizes 200 mb rawinsonde data and AIREPS above 29,000 ft within 6 hours of the 0000Z and 1200Z synoptic times.

JTWC utilizes the FLEWEACEN Guam Computer Center for objective forecast techniques and statistical post-analysis.

In addition, the standard array of synoptic-scale computer analyses and prognostic charts are available from the Fleet Numerical Weather Central (FNWC) at Monterey, California.

b. JTWC ANALYSES:

(1) Combined surface/gradient level (3,000 ft) streamline analysis over tropical regions and an isobaric analysis in more northern latitudes and around intense tropical systems at 0000Z and 1200Z. The blend between streamlines and isobars fluctuates as the pressure gradient changes from season to season. Low-level wind directions from satellite data are included in the analysis.

(2) 500 mb contour analysis at 0000Z and 1200Z.

(3) Composite upper-tropospheric streamline analysis, utilizing rawinsonde data from 300 mb through 100 mb, wind directions extracted from satellite data by Det 1, 1WW and AIREPS (plus or minus 6 hours) at or above 29,000 feet, at 0000Z and 1200Z.

(4) Additional sectional analyses similar to those above, at intermediate synoptic times, during periods of tropical cyclone activity.

c. AIRCRAFT RECONNAISSANCE:

These data are invaluable in the positioning of centers of developing systems and essential for the accurate determination of the maximum intensity, minimum sea-level pressure, and radius of significant winds exhibited by tropical cyclones. Aircraft reconnaissance data are plotted on large-scale sectional charts for each mission flown. A comprehensive discussion of aircraft reconnaissance is presented in Chapter II.

d. SATELLITE DATA:

The Defense Meteorological Satellite Program (DMSP) played a major role in the early detection of tropical cyclones in 1976. A discussion of this role, as well as applications of satellite data to tropical cyclone tracking, is presented in Chapter II.

e. RADAR:

During 1976, land radar coverage was utilized more extensively in the Selective Reconnaissance Program than ever before. Once a storm moved within the range of a land radar site, reports were usually received hourly. Use of radar during 1976 is discussed in Chapter II.

3. FORECAST AIDS

a. CLIMATOLOGY:

Climatological publications utilized during the 1976 typhoon season include previous JTWC Annual Typhoon Reports and climatic publications from Fleet Weather Central Guam, Director Naval Oceanography and Meteorology, Naval Weather Research Facility, Naval Environmental Prediction Research Facility, Naval Postgraduate School, Air Weather Service, First Weather Wing and Chanute Air Training Center, plus publications from other Air Force and Navy activities, various universities and foreign countries.

b. OBJECTIVE TECHNIQUES:

The following objective techniques were employed in tropical cyclone forecasting during 1976. A description and an evaluation of these techniques is presented in Chapter V:

- (1) TYFN75
- (2) MOHATT 700/500
- (3) FCSTINT
- (4) 12-HR EXTRAPOLATION
- (5) HPAC
- (6) XT24
- (7) INJAH74

4. FORECASTING PROCEDURES

a. INITIAL POSITIONING:

An initial center position is determined from a subjective evaluation of center fix data and synoptic data. When these data sources are not available, extrapolation from the previous position is used.

b. TRACK FORECASTING:

An initial forecast track is developed based on persistence, climatology and objective techniques. This initial track is subjectively modified based on the following:

(1) The prospects for recurvature are evaluated for all westward and northward moving storms. This evaluation is based primarily on present and forecast position and amplitude of middle tropospheric mid-latitude troughs from the latest 500 mb analysis and numerical prognoses.

(2) Determination of steering level is partly influenced by maturity and vertical extent of the system. For mature storms located south of the 500 mb subtropical ridge, forecast changes in speed of movement are closely correlated with forecast changes in the intensity of the ridge. When steering currents are very weak, the tendency for storms to move northward due to internal forces is an important consideration.

(3) Over the 12- to 72-hr forecast spectrum, speed of movement during the early time frame is biased toward persistence, while that near the end of the time frame is biased towards analogs and climatology.

(4) A final check is made against climatology to ascertain the likelihood of the forecast track. If the forecast deviates greatly from climatology, the forecast rationale is reappraised and the track adjusted as necessary.

c. INTENSITY FORECASTING:

In forecasting intensity, heavy reliance is placed on aircraft reconnaissance reports, the Dvorak satellite interpretation model, and the objective techniques discussed above. Additional considerations are the position and intensity of the tropical upper-tropospheric trough, extent and intensity of upper-level outflow, sea surface temperature, terrain influences, speed of movement, and proximity to an extratropical environment.

5. WARNINGS

Tropical cyclone warnings are numbered sequentially. If warnings are discontinued and the storm reintensifies, warnings are numbered consecutively from the last warning issued. Amended or corrected warnings are given the same number as the warnings they modify plus a sequential alphabetical designator. Each warning includes the location, intensity, direction and speed of movement, and the radial extent of 30, 50, and 100 kt surface winds (when applicable). Warnings within the JTWC Pacific Area are issued within 2 hours of 0000Z, 0600Z, 1200Z and 1800Z with the constraint that the 2 consecutive warnings may not be more than

seven hours apart. This variable warning time allows for maximum use of all available reconnaissance platforms and spreads the workload in multiple storm situations. The forecast intervals for all tropical cyclones, regardless of intensity, are 12-, 24-, 48-, and 72-hr.

Warnings in the JTWC Indian Ocean area are issued within 2 hours of 0800Z and 2000Z with the constraint that 2 consecutive warnings may not be more than fourteen hours apart. Warnings for this area are issued only after a tropical cyclone has attained an intensity of greater than 33 kt. Forecast intervals are 24 and 48 hours.

Warning forecast positions are verified against the corresponding post analysis "best track" positions. A summary of the verification results for 1976 is presented in Chapter V.

6. PROGNOSTIC REASONING MESSAGE

In the Pacific Area, prognostic reasoning messages are transmitted at 0000Z, 1200Z or whenever the previous reasoning is no longer valid. This message is intended to provide field meteorologists with the reasoning behind the latest JTWC forecast. Prognostic reasoning messages are not prepared for tropical depressions nor for the Indian Ocean area.

7. SIGNIFICANT TROPICAL WEATHER ADVISORY

This message, summarizing significant weather in the entire JTWC area of responsibility, is issued by 0600Z daily. It contains a detailed, non-technical description of all significant tropical disturbances, and the JTWC evaluation of potential for tropical cyclone development.

8. TROPICAL CYCLONE FORMATION ALERT

Alerts are issued whenever interpretation of satellite and other meteorological data indicates significant tropical cyclone formation is likely. These alerts will specify a valid period not to exceed 24 hours and must either be cancelled, reissued or superseded by a warning prior to expiration of the valid period.